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## India CP – Moon Solvency 1/3

### ISRO has current technology to explore the moon for Helium-3

Mishra 10 December 11, 2010 by Amit Kumar Mishra http://mishraamit.wordpress.com/2010/12/11/india-has-joined-the-race-for-mining-the-moon/

The huge availability of Helium 3 in the moon can be a source to solve future energy needs of earth, Former Indian Space Research Organisation (ISRO) Chairman G Madhavan Nair said. Speaking on Moon Mission at the three-day Global Conference on Cosmologies, which began at the National Institute of Advanced Studies here, Dr Nair said, ”If we can excavate, release and bring it to the earth, it will be a fantastic contribution by the Indian space sector.” He said in next 10-15 years India could have robotic excavations that can get helium on the Moon,” he said. (He-3) is a light, non-radioactive isotope of Helium with two protons and one neutron. It is rare on Earth, and is sought for use in nuclear fusion research. Referring to detection of Helium-3 on the moon’s surface during India’s Moon Mission Programme, he said, ”Helium-3 was indirect finding.” The discovery of a helium isotope, helium-3, on the moon has given scientists ideas on how to produce electricity far more efficiently than with hydrocarbons or current nuclear plants. The large amounts of energy would come without danger of releasing radioactive substances into the atmosphere. Helium-3 is considered a safe, environmentally friendly fuel. NASA’s Vision for Space Exploration has U.S. astronauts scheduled to be back on the moon in 2020 and permanently staffing a base there by 2024. But America is not the only nation with plans for a moon base. China, India, the European Space Agency, and at least one Russian corporation, Energia, have visions of building manned lunar bases post-2020. The Chinese, too, apparently believe that helium-3 from the moon can enable fusion plants on Earth. This fall, the People’s Republic expects to orbit a satellite around the moon and then land an unmanned vehicle there in 2011. Simultaneously, Japan and Germany are also making noises about launching their own moon missions at around that time, and talking up the possibility of mining He3 and bringing it back to fuel fusion-based nuclear reactors on Earth. At present market prices of petroleum products, a tonne of Helium-3 costs not less than Rs 13,500 crore as against Rs 140 crore per tonne of gold. It is precious than enriched uranium, not only in terms of its value but also in terms of radioactive Emission.Helium-3 is clean and less radioactive than uranium and thorium. And the Moon is said to have one million tonnes of Helium-3. Chandrayaan-1 will explore whether the Moon has even larger stocks of this clean nuclear fuel. According to ISRO scientists, Helium-3 is present in the Moon’s regolith (loose rocks or mantle) just below the surface of its false seas (maria). Incidentally, Helium-3 is the only lunar resource worth extracting and bringing back to Earth. The human planet too has Helium-3 reserves, but they are less than 200 kgs. A tonne and a half of Helium-3 is sufficient to light up India for 365 days. India’s total yearly consumption being far less at 130,000 MW, the same 25 tonnes of He3 will fire India’s consumption for several years. India has an ambitious dream of producing 400,000 MW by 2030.The He3 reactors will only become a reality 50 years hence, It is a futuristic fuel, if at all. India will have a greater advantage under the IPR regime, since it has not only spent Rs 386 crore on the mission but also came out with new findings on Helium-3.

### ISRO successful in lunar missions

Economic Times 09 25 Sep, 2009 “Courtesy ISRO, we found water on Moon: NASA,” http://economictimes.indiatimes.com/features/courtesy-isro-we-found-water-on-moon-nasa/articleshow/5053544.cms

WASHINGTON: NASA on Thursday revealed that India's maiden lunar mission Chandrayaan-I had traced water molecules on the moon's surface. It also "thanked" ISRO for making the discovery possible. "We want to thank ISRO for making the discovery possible. Moon till now was thought to be a very dry surface with lot of rocks," NASA said in a press conference. Earlier in the day, as news trickled out about Indian maiden lunar mission tracing water molecules on the moon's surface, scientists rejoiced at the discovery and hope that it will pave the way for growing vegetation in the earth's natural satellite in future. "I am really very happy to know that the NASA payload on Chandrayaan-1 has traced water. If it is true then it will pave the way for growing vegetation in moon surface in five or 10 years from now," renowned scientist Y S Rajan said. "Even if there is no water in its complete H20 format, still it's a great feat. It will help make human venturing to moon a more enriching experience. Those going to moon can combine the molecule and get water. "They can also break it and get oxygen which is a major problem for scientists in space," said Rajan, who has written the book India 2020: A Vision for the New Millennium, along with former president A P J Abdul Kalam. He said India's moon mission was a "great success" that proved ISRO's capability and efficiency in managing key space projects. "We have received loads of data from moon via our mission. It has certainly enriched the global scientific community."

## India CP – Moon Solvency 2/3

### India plans for lunar mission in 2013

Economic Times 11“Moon has helium-3 power: ISRO,” http://articles.economictimes.indiatimes.com/2009-09-26/news/27634847\_1\_chandrayaan-1-hyper-spectral-imager-chandrayaan-2 ET Bureau Sep 26, 2009

BANGALORE: India's space agency said on Friday that it has been able to detect deposits on the moon of a mineral which can be used to fuel power plants, a day after the announcement of incontrovertible evidence of the presence of water on earth's only natural satellite. The Chandrayaan-1 spacecraft, which set out on India's first lunar voyage in October last year, has identified deposits of helium-3 (He-3), accomplishing one of the key objectives of its mission, top officials of the Indian Space Research Organisation (Isro) said. "Our mineral mapper has identified that there are plenty of these areas where such compounds are present. That gives the indication; we can further look for exact details of the quantity with our Chandrayaan-2 mission," Isro chairman G Madhavan Nair said. India's second lunar sojourn is due in 2013.

### NASA and ISRO plan lunar mission

NDTV 11 “ISRO announces new moon mission, ”NDTV Correspondent: February 13, 2011 NDTV provides latest news from India and the world @http://www.ndtv.com/article/india/isro-announces-new-moon-mission-85086

New Delhi: As Space Commission, the country's top policymaking body on space affairs, met against the backdrop of the Antrix-Devas spectrum controversy, a surprise announcement was made. The commission has approved the proposal for a joint moon mission between ISRO and Jet Propulsion Laboratory, a premier American agency. The mission called Moonrise is slated for launch in 2016 and now it's for NASA to take the final call on the proposal. "NASA has sought a proposal for moonrise mission. Jet Propulsion laboratory is a pioneer in planetary exploration visiting Mars and Venus and if it seeks Indian partnership it is creditable," said K Radhakrishnan, Chairman, ISRO. This move comes barely two months after greater space cooperation came up in talks between Prime Minister Manmohan Singh and US President Barack Obama. Moonrise, which will be launched from American soil, hopes to orbit the moon, land there, and bring back nearly one kg of moon rock for further analysis. India has proposed to give a satellite similar to Chandrayaan-1. Till a few weeks ago, ISRO was listed on the dreaded Entity List and the US shunned close contact. But after Chandrayaan-1 helped find water on the moon, now a new Indo-US space bonhomie is set to bloom on the parched moon surface.

## India CP – Moon Solvency 3/3

### NASA rejected ISRO for Lunar Mission, ISRO plans for solo lunar mission in 2014

Laxman 11 “US abandons joint unmanned Moon Mission, Isro upset,” May 26, 2011 By Srinivas Laxman -Senior Subject Matter Expert at Amdocs http://www.firstpost.com/world/us-offloads-india-from-joint-unmanned-moon-mission-16264.html

In a major setback to India’s lunar programme, the US National Aeronautics and Space Administration (Nasa) on Tuesday offloaded this country from a joint unmanned mission to the moon designated as MoonRise. The offloading comes six months after Prime Minister Manmohan Singh and US President Barack Obama announced the strengthening of Indo-US space collaboration in a joint declaration in New Delhi in November 2010. MoonRise, as well as another Nasa mission to Venus, were rejected in favour of a flight to an asteroid called the “Origins Spectral-Interpretation-Resource-Identification-Security-Regolith-Explorer”,’ in which the Indian Space Research Organisation (Isro) is not involved. The MoonRise plan envisaged Isro partnering with Nasa’s Jet Propulsion Laboratory (JPL) which was announced by Isro chairman K Radhakrishnan in New Delhi on 12 February 2011. The tie-up was given the go-ahead by the Space Commission. At a media meet after the commission meeting, Radhakrishnan said: “We will have to send a Chandrayaan-1 like probe that will orbit the moon for about four-to-five years. The 400-500 kg satellite around the moon could carry some scientific experiments of Isro,’’ he said. He said that the proposal was an outcome of Indo-US space cooperation announced during the visit of President Obama in November 2010. India’s contribution to the MoonRise project would have been about $150 million. As a part of this lunar project, Nasa had asked Isro to build an orbiter for providing communication between the rover operating on the lunar surface and the ground stations. Isro had even initiated preliminary studies on the project, and exchange of information was in progress between Isro and JPL when the project was scrubbed on Tuesday. According to those in the know, Isro’s involvement has more than technical significance. If the project had materialised, it would have underlined a change in Indo-US security relations. Until now US labs and companies were prohibited from exchanging technologies with Isro in an attempt to limit their use for military purposes. It was a sample return mission, which means Nasa would have brought back samples from the moon for analysis. MoonRise would have focused on the giant South Pole Aitken Basin located on the far side of the moon. Though Isro officially declined to comment on the rejection, other space agency officials expressed disappointment at Nasa’s decision, calling it a serious setback to India moon dreams. They were shocked at Nasa’s decision because it has come six months after Manmohan Singh and Obama announced the strengthening of Indo-US space collaboration in a joint declaration in New Delhi. Isro and Nasa had collaborated in India’s maiden mission to the moon, Chandrayaan-1. There were two Nasa payloads on this mission, the Moon Minerology Mapper and Mini-Sar. Nasa was hoping to participate in Chandrayaan-2, too—a joint Indo-Russian venture. But, as of now Isro has no plans of including foreign participation other than Russia. The rejection by Nasa of Isro’s participation in MoonRise could not have come at a worse time for Isro because the Chandrayaan-2 flight has been delayed because of uncertainties in the rocket, the three-stage Geo Synchronous Satellite Launch Vehicle (GSLV). Originally, it was slated for liftoff in 2012. It got postponed to 2013 and is now tentatively scheduled for 2014. “Even this date is uncertain because we are having a lot of problems with the GSLV,’’ a top Isro official said.